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IN THE UNITED STATES

PATENT AND TRADEMARK OFFICE

Appl. No.	:	**10/659,187**
Applicant(s)	:	**Schroder, K.**
Filed	:	**09/10/2003**
Title	:	**METHOD OF PRODUCING AN ULTRA THIN ELECTRICALLY CONDUCTING FILM WITH VERY LOW ELECTRICAL RESISTANCE**
TC/A.U.	:	**2822**
Examiner	:	**Rose, Keisha L.**
Atty. Docket	:	**156P034**

APPEAL BRIEF under 37 C.F.R. § 41.31

Mail Stop Appeal Brief-Patents
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

In response to the Final Office Action of September 6, 2005, please accept the following Appeal Brief in the above referenced application.

Real Party In Interest

The real party in interest is the assignee, Syracuse University, Syracuse, New York 13244.

Related Appeals and Interferences

None.

Status of Claims

Claims 1-13 are pending and finally rejected.

Status of Amendments

No amendments were filed after the final rejection of September 6, 2005.

Summary of Claimed Subject Matter

An apparatus includes a substrate (20) and an electrically conducting film (30) deposited on the substrate (20), wherein the film is a metal other than Cr or Cr-alloys when said substrate is Ge or Si, or the film is a metallic alloy, or a multilayered film which includes at least one metallic layer. The substrate (20) consists essentially of a substrate material which forms a bond with the film wherein the deposition is in at least a high vacuum environment, where "high vacuum" refers to pressures between 10^{-3} Torr and 10^{-6} Torr (para. 18, specification). The result is an ultra thin film with very low electrical resistance (Fig. 1; para. 18-19 specification).

Although manganese is a metal with very high room temperature resistivity (para. 20, specification), a manganese film deposited in at least a high vacuum environment on a germanium substrate surprisingly has a low resistivity (para. 20, specification). A 0.1 nm thick manganese film deposited in this way on a germanium substrate has a resistivity which at room temperature is lower than the resistivity of metal films of aluminum and copper with the same thickness prepared the same way (para 12, specification). It was also found that exposing the germanium substrate to air before the metal film was deposited led to much higher resistance values than found when depositing the metal film on a germanium substrate not exposed to air (para. 24, specification).

Grounds of rejection to be reviewed on appeal

Claims 1-13 are rejected under 35 U.S.C. § 102(e) as being anticipated by Olivas et al. (U.S. Patent No. 6,507,187).

Claims 8 and 11-13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Olivas et al. (U.S. Patent No. 6,507,187).

Argument

Rejection of claims 1-13 under 35 U.S.C. 102(e) over U.S. Patent No. 6,507,187 (Olivas et al.)

The standard for anticipation is succinctly stated as "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Applicant maintains that Olivas et al. does not disclose a conductive film deposited on a substrate and which forms a bond with the substrate as claimed in claim 1. Olivas et al. instead shows a conductive film, tantalum layer 120 in Fig. 2 of Olivas et al., which is deposited on a silicon dioxide layer as revealed in column 4, lines 61-62, rather than on the substrate. Nowhere in Olivas et al. does there appear a disclosure of depositing a metal layer on silicon rather than on silicon dioxide.

Applicant suggests that the claim language in Olivas et al. supports this argument. The claims in Olivas et al. are directed towards "a substrate carrying a hard magnetic film" rather than a hard magnetic film deposited on a substrate. The language in claim 11 of Olivas et al. specifically refers to "an oxidized silicon substrate" with "a first layer of tantalum on the oxidized silicon substrate." This claim language is entirely consistent with the remainder of the specification in Olivas et al. and the fact that the tantalum layer is deposited on oxidized silicon rather than on silicon as Applicant's claim requires. See also column 5, line 1 wherein the substrate is referred to as "silicon dioxide/silicon substrate." Table 1 of Olivas et al. also refers to the substrate as "thermally grown SiO_2/Si."

Applicant respectfully points out that Applicant's invention does not work for its stated purpose if the substrate is oxidized (para. 24, specification). Thus claim 1 of the present application claims "an electrically conducting film deposited on a substrate" and the further limitation that the "substrate consists essentially of a substrate material which forms a bond with said film", which is not disclosed in the reference. Instead, the reference discloses a substrate which bonds with an oxide layer which in turn bonds with an electrically conducting film.

A broad reading of claim 1 of the present application, which is certainly the way for the examiner to interpret the claim, yields the following results when comparing the claim to the reference. A substrate is present in the reference. If the substrate is considered to be silicon, then the electrically conducting film is not deposited on the substrate in the reference and the reference does not anticipate the claimed invention.

On the other hand, if the substrate is considered to be silicon/silicon dioxide, then the electrically conducting film is deposited on the substrate in the reference. But if we follow this interpretation, note that in the claim the substrate must consist essentially of a substrate material which forms a bond with the film. In the reference, the film bonds with the silicon dioxide, which under the logical limitations of the claim (i.e., in order to read on the claim) must be the substrate material. But if the substrate material is silicon dioxide, it can't be silicon/silicon dioxide. Because the conclusion is logically inconsistent, the premise must be false. Therefore the substrate cannot be silicon/silicon dioxide and meet the limitations of the claim which require the substrate to consist essentially of a substrate material which forms a bond with the film. Therefore the reference cannot anticipate the reference. As they say in logic class, Q.E.D. Allowance of claims 1-13 is therefore respectfully requested.

<u>Rejection of claims 8 and 11-13 under 35 U.S.C. 103(a) over U.S. Patent No. 6,507,187 (Olivas et al.)</u>

Claims 8 and 11-13, being dependent upon and further limiting independent claim 1, should be allowable for that reason as well as for the additional limitations they contain.

As for claim 8, the examiner fails to present a *prima facie* case of obviousness. The mere recitation that "it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art" does not mean that only routine skill in the art was required in the instant case. Certainly Applicant is entitled to a well reasoned analysis under *Graham v. John Deere* before receiving a rejection for unpatentability. The reference is silent on electrical resistance for the film layers and states that the total thickness of all deposited layers is 28.48 nm (column 7, lines 34-35) which is a far cry from the "less than 0.2 nm thick" of claim 8. In addition, the weight of the prior art is against the limiting parameters recited in claim 8. See, for

instance, para. 5 of the specification. Allowance of claims 8 and 11-13 under 35 U.S.C. 103(a) is therefore respectfully requested.

Respectfully submitted,

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APPENDIX OF CLAIMS

1. An apparatus, comprising:

a substrate;

an electrically conducting film deposited on said substrate, wherein said film is a metal other than Cr, or said film is a metallic alloy other than Cr-alloy when said substrate is Ge or Si, or a multilayered film which includes at least one metallic layer;

wherein said substrate consists essentially of a substrate material which forms a bond with said film; and

wherein said deposition is in at least a high vacuum environment.

2. An apparatus according to claim 1, wherein said substrate material is selected from the group consisting of Ge, Si, As, B, Bi, C, Ga, Se, Te, Fe, Al, W, Mo, Ta, Nb, V, Hf, Zr, Re, semiconducting compounds, halides, and co-deposited mixtures of incompatible systems.

3. An apparatus according to claim 2, wherein said film is a material selected from the group consisting of Mn, Ag, Fe, and Cu.

4. An apparatus according to claim 2, wherein said film is a material selected from the group consisting of Mn, Ag, Fe, Al, Au, Ni, Pd, Pt, Co, and their alloys.

5. An apparatus according to claim 2, further comprising an overlayer on said conducting film, wherein said overlayer is selected from the group consisting of Ge, Si, As, B, Bi, C, Ga, Se, Te, Fe, Al, W, Mo, Ta, Nb, V, Hf, Zr, Re, semiconducting compounds, halides, and co-deposited mixtures of incompatible systems.

6. An apparatus according to claim 1, wherein said film is a material selected from the group consisting of Mn, Ag, Fe, and Cu.

7. An apparatus according to claim 1, wherein said film is a material selected from the group consisting of Mn, Ag, Fe, Al, Au, Ni, Pd, Pt, Co, and their alloys.

8. An apparatus according to claim 1, wherein said film is less than about 0.2 nm thick and has an electrical resistance of less than $4x10^{-6}$ Ohm•m.

9. An apparatus according to claim 6, in which said substrate is less than 5 nm thick.

10. An apparatus according to claim 1, wherein said substrate material forms a metastable bond.

11. An apparatus according to claim 1, wherein said vacuum environment has a base pressure reduced to a value below 10^{-5} Torr.

12. An apparatus according to claim 1, wherein said vacuum environment has a base pressure reduced to a value below 10^{-6} Torr.

13. An apparatus according to claim 1, wherein said vacuum environment has a base pressure reduced to a value below 10^{-7} Torr.